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AN  
INAUGURAL THESIS,  
ON  
SENSATION & MOTION,

SUBMITTED TO  
*THE EXAMINATION*

OF THE  
REV. JOHN ANDREWS, D. D. PROVOST, (Pro Tem.)

THE  
TRUSTEES AND MEDICAL PROFESSORS

OF THE  
*UNIVERSITY OF PENNSYLVANIA,*

On the 21st day of April, 1806.

FOR  
THE DEGREE  
OF  
*DOCTOR OF MEDICINE.*

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BY JOHN HART,  
OF  
*ORANGE, NORTH-CAROLINA.*

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1806.



TO  
Dr. JOHN UMSTEAD,  
OF  
*HILLSBOROUGH, NORTH-CAROLINA.*

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DEAR SIR,

FOR the pains you have ever taken, to instruct me in the pleasing paths of Medical Science ;—for the high sentiments of esteem I bear you, as a professional character ; and still more for your parental kindness towards me, I beg leave to offer, as a dedication, this imperfect production.—If it is in any respect, worthy of your approbation, it will be productive of the most sanguine happiness to

Your Friend,

and Pupil,

JOHN HART.





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AN  
ESSAY  
ON  
*SENSATION, AND MOTION.*

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WHEN I reflect on the obscurity of the subject on which I am now about to enter ; the critic world, to whose inspection it is to be subjected ; and my own incapability of doing justice to it, I am on the very verge of recoiling from the task ; and abandoning the pursuit, which alone can place me on an equality with the medical world : But in conformity to the laws of the institution, from which I have obtained my medical education, which make it indispensably necessary that I should become an Author, I attempt it ; not without being conscious of the errors of judgment to which I, with every other person, am liable.

The subject which I have chosen for my thesis has, in all ages, been discussed by medical men. Old opinions have been laid aside ; and those that displaced them embraced with great eagerness :—Yet they have left us, like a blind man searching for a feather, on a windy day. Clouds of ignorance still intercept our view ; and we are lured from the pleasing paths of truth, by the art of reasoning, into the mazes of subtle ingenuity.

The word *Sensation*, as defined by authors, is generally made to express a sense of pleasure, or pain, in some part of the body. With this acceptation, I shall proceed to inquire into its seat.

Dr. Blumenbach, the illustrious physiologist, in his treatise on this subject, has wandered far from the paths of truth, and does very little for it, when compared with the rest of his works. In his physiology (Vol. 1st. page 215) he says, "The nerves are peculiarly subservient to sensation; whatever sensible impressions are made on the body, they, like active heralds, convey, and announce immediately to the sensorium, and there give rise to perception." In this short sentence, this great man has made a very great mistake:—For if the nerves were peculiarly subservient to sensation, the application of the agent producing it, must be to the nerve itself. It is physically impossible to produce sensation without the immediate application of the agent to its seat.

This being true, one question arises, which will incontestibly decide the dispute, and that is, whether the system is made up entirely of nerves, or not? The question is plain, and must be answered, without argumentation, either in the negative, or affirmative. Is there an anatomist in the world that would say yes? Not one:—Then I positively assert that the position taken by the illustrious author is erroneous:—For there is not one part or particle of the human system, which possesses vitality, which does not also possess sensation. The sharpest pointed instrument cannot be applied to any, the smallest portion of muscular fibre, in the body without producing sensation instantaneously: But if the nerves were its sole organs, the instrument must inevitably be applied to them, in order to produce it.

We cannot, with any propriety, say that any one part or system, of the body, is the peculiar seat of sensation:—For I be-

lieve there is not one part without it : But it appears to me, that if there is one part which has a greater claim to it than another, it is the muscular.

I believe that the muscles are the true organs of sensation ; that the brain is the true organ of sense ; and that the nerves are nothing more than a medium, through which a knowledge of the impressions, or sensations made on the muscles, is communicated to the brain, where, the sense, or the will is immediately brought into operation, and conveyed from it through the same medium, to the muscles acted on by the first impressions.

In paralysis, it is not either the brain, or muscles, that are affected, it is the nerves only : The muscle here loses its functions in consequence of the affection of the nerve ; for as soon as the nerve is capable of transmitting the will from the brain to the muscles, motion is also restored. Perhaps it may be said that we do not know that it is the nerve that is affected in palsy. I admit that we do not know it as a fact : but if we reason from analogy, we shall not hesitate a moment in pronouncing it to be an affection of the nerve altogether. Every man who has paid any attention to anatomy knows that if a ligature be tied round a nerve going to a muscle, the motion of that muscle is immediately obstructed ; and on loosening the ligature, voluntary motion is again restored.

While the ligature is around the nerve, we are not by any means deprived of volition ; but may will as strongly to move the muscles now, as before the application of the ligature. The nerve being incapable of transmitting the will from the brain, to the muscles, we are in consequence of that inability, deprived of the power of moving the muscles. In this case the faculty of the brain is not injured ; nor are the muscles deprived of their vitality or functions.

On the very same cause, does the palsy depend ; for we know very well, that we can exert the will as strongly at this time, as at any other, without being able to effect a motion, in consequence of the nerve being deprived of its functions.

It may be said that there is no sensation in a paralytic limb : But in this there is very little reason ; for wherever there is irritation, there, also, must be sensation ; for it is impossible to produce the former without, at the same time, producing the latter. I do not mean to say, here, that they are synonymous terms, or that they are necessarily produced by each other : For I believe that sensations of pain are often produced by want of irritation, as in cases of chronic pains of any kind. From this I would infer, that sensation is not peculiar to the nerves ; but that it is in the muscles.

Dr. Darwin, in his treatise on the motions of the retina, (page 16th) says, “ That one side of the face has sometimes “ lost its power of sensation ; but retained its power of motion.” Here the affection must have been altogether in the muscles ; for we know, that if the nerve had been affected, the will could not have been conveyed from the brain to the muscles, which is indispensably necessary for their action.

If you take hold of your hand, or leg, or any other part of your body, and pinch it, and while you are thus acting take notice where the pain is, you will perceive that it is altogether local, and that too, in the very spot where you are pinching :— But at the same time you have a very strong sense of it in the brain.

If the sensation itself was communicated to the brain, we should have the pain travelling from the place where it was first received, through the whole course of the nerve, to the

brain. But instead of that, it is confined entirely, to the very spot, where we first perceived it.

I now proceed to the consideration of the other part of my subject, that is, VOLUNTARY MOTION. I say voluntary motion, because I shall attempt to prove in this dissertation that all the healthy motions of the body are so,—and I shall allude to those entirely.

This like every other metaphysical subject has caused a great deal of controversy among Medical men. Some of those disputants have asserted that motion is the effect of irritability, and that this belongs altogether to the muscles.

Dr. Blumenbach was of this opinion ; and divided motion into Voluntary, Involuntary, and what he called mixed motion : that is where the motion is sometimes subject to the will and sometimes not.

Dr. Darwin has divided motion into four different classes, *viz.* Irritative, Sensitive, Voluntary, and Associate :—This division has, also, its abettors. As I do not believe these divisions to be correct, I shall not say more about them than is necessary to communicate my own opinions.

There are but very few muscles in the body, which physiologists have taken from under the power of the will ; and those few certainly are, by far, the most essential to life, of any in the body.

The action of the heart, the diaphragm, the stomach, and intestines, and also those of the pupil of the eye ; have all been deprived of the benefits of that great agent of motion in other parts of the body (i. e.) the will :—But I shall endeavour to restore them to their proper situation, and rights ; and give them

a greater claim on the will, for its beneficial assistance, than any other parts.

It is said by all physiological writers, that the action of the heart and arteries, is kept up by the stimulus of the blood, combined with the power of habit. That the will has no power over it. Here however I shall reverse the matter, and subject their action to the will, and powers of habit.

If the blood acted as a stimulus to the heart and arteries, their action would be in a just ratio with the quantity they contained :—For we know that every other stimulus acts in proportion to the quantity given. If we give a certain dose of wine or opium, the action of the heart is greatly increased ; and in proportion as the stimulus is abstracted, the frequency of the pulse is diminished. The effect of every stimulus with which we are acquainted is, that after it has been used for some time, it loses that effect which it at first had, altogether ; and becomes perfectly inactive in the system. I say stimulus is an unit : and if the blood was the stimulus, which it is supposed to be, certainly in proportion as the quantity was diminished, the frequency of the pulse would also be diminished :—But this is not the case, for we know positively, that in proportion as the blood flows from an animal, bleeding to death, or as the volume of blood in the circulating system is diminished, the frequency of the pulse is increased. There then must be some other agent than the stimulus of the blood or habit. What is it ? We have a greater will to protract life, than for any thing else in nature, and as the circulation of the blood is indispensably necessary to that end, and in consequence of its volume being diminished, the will, in order that the circulation might be kept up, acts with greater force on the heart, causing it to contract, and to throw out the small quantity which it contained.



Is not the heart furnished with nerves precisely of the same kind, and from the very same source as those of the other parts of the body ? With what propriety can we suppose, that nerves originating from the same source, of the very same structure, and going to the same kind of fibres, should be so different as to their functions ? Can we give any reason for supposing that the nerves going to the heart, are deprived of the power of transmitting the will, when other nerves, precisely similar in every respect, have that power ?

There are cases related both by Blumenbach, and Darwin, wherein persons have had the power of suspending the action of the heart and arteries at pleasure ; if this was not a voluntary motion they never could have had such command over this organ. Darwin states the case, also, of a man, who could, at any time so increase the peristaltic motion of the intestines, as to produce an elimination of the contents of the rectum, in the space of half an hour.

It is not necessary, that we should always be conscious of the operations of the will, in order for it to act. If it was, we should not be able to perform one action, and think on another, at the same time ; which we can, and do do, almost every moment of our lives. If the will could not act without our being conscious of it, I could not get up, and walk across my room, and continue thinking on what I am writing, at the same time : For it is impossible for a man to think on two things at once. But I do will to rise up and walk about, without my chain of thought being broken. If while I am thus walking about, I will to put my hand in my pocket, I instantly do it without being in the least conscious of it. Here volition is occupied with the muscles that move the body. While reason is entirely detached from the body, and acts altogether on my subject.

Perfectly analogous to the operation of the will on the heart, is that of every other agent of motion on the body, in nature : For by their continued application to the moving fibres, we gradually become unconscious of their operation, although they continue to keep up the action of the part as vigorously as ever.

The motions of the diaphragm are kept up precisely in the same way. Dr. Darwin places this under the head of his associate motions : But this is another *error loci*: for it certainly is as much under the power of the will as any muscle in the body. We can suspend its action at pleasure : But it may be said, that the action of the diaphragm is suspended only in consequence of the suspension of respiration, or the action of the lungs. If the action of the diaphragm was kept up by association with that of the lungs, Why does not respiration go on when there is a ligature around the phrenic nerve ? The ligature here does not affect the lungs at all. The reason is, the will is cut off from the diaphragm by the ligature ; and in consequence of that, the action is stopped. If it was from association, that the action was kept up, the ligature here would not affect it, because the action of the lungs would be sufficient in itself for that purpose.

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